

LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA2 | Camden Town and HS1 Link

Water resources assessment (WR-002-002)

Water resources

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Department
for Transport

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1 Introduction

1.1 Structure of the water resources and flood risk assessment appendices

- 1.1.1 The water resources and flood risk assessment appendices comprise three parts. The first of these is a route-wide appendix (Volume 5: Appendix WR-001-000).
- 1.1.2 Two specific appendices are also provided for each community forum area (CFA). For the Camden Town and HS1 Link CFA (CFA2) these are:
- a water resources assessment (i.e. this appendix); and
 - a flood risk assessment (Volume 5: Appendix WR-003-002)
- 1.1.3 Maps referred to throughout the water resources and flood risk assessment appendices are contained in the Volume 5, Water Resources and Flood Risk Assessment Map Book.

1.2 Study area

- 1.2.1 The Camden Town and HS1 Link area covers a 2.6km section of the Proposed Scheme connecting to the HS1 network. CFA2 is located to the east of the Primrose Hill to Kilburn (Camden) CFA (CFA3) and to the north of the Euston Station and Approach CFA (CFA1) in the London Borough of Camden (LBC) and the London Borough of Islington (LBI). The HS1 link is located to the south of Maitland Park and Kentish Town, and to the north of Somers Town and King's Cross.
- 1.2.2 The spatial scope of the assessment was based upon the identification of surface water and groundwater features within 1km of the centre line of the route, except where there is clearly no hydraulic connectivity. For surface water features in urban areas, the extent was reduced to 500m. Outside of these distances it is unlikely that direct impacts upon the water environment will be attributable to the Proposed Scheme. Where works extend more than 200m from the centre line, for example at stations and depots, professional judgement has been used in selecting the appropriate limit to the extension in spatial scope required. For the purposes of this assessment this spatial scope is defined as the study area.
- 1.2.3 The 2.6km section of the route in the Camden Town and HS1 Link area will be predominantly on viaduct and will not cross any surface water features.
- 1.2.4 The main environmental features of relevance to water resources within the study area include:
- the Grand Union Canal (GUC) (the Regent's Canal);
 - the Chalk Principal aquifer; and
 - the Lambeth Group and Thanet Sand Formation Secondary A aquifers.

- 1.2.5 Key environmental issues relating to water resources include the potential to adversely impact on the water quality in the GUC (the Regent's Canal).
- 1.2.6 Where there is a residual impact to water resources and following mitigation there is a consequent effect on ecology, this is discussed further in Volume 2, Camden Town and HS1 Link (CFA report 2), Section 7.

2 Stakeholder engagement

2.1.1 Discussions have been held with the following stakeholders to inform the water resources and flooding assessment:

- the Environment Agency; and
- the Canal & River Trust (formerly British Waterways) with regard to the Regent's Canal.

3 Baseline data

3.1 General

- 3.1.1 The following section provides a current description of water resources within the study area including surface water and groundwater features.
- 3.1.2 All water bodies in this area fall within the London sub-catchment of the Thames river basin district (RBD) as defined under the Water Framework Directive¹ (WFD) and are covered by the River Basin Management Plan² (RBMP).

3.2 Surface water features

- 3.2.1 All surface water features within 500m of the route³ are presented in Table 1.
- 3.2.2 The current surface water baseline is shown on Map WR-01-002 (Volume 5, Water Resources and Flood Risk Assessment Map Book). Water features with codes listed in Table 1 are shown on Map WR-01-002 (Volume 5, Water Resources and Flood Risk Assessment Map Book). The map reference is in one of two forms. If the feature has a specific reference number then this is provided (e.g. a surface water crossing will be referenced as SWC-CFA02-01). If the feature has no specific reference its location on a specific map is provided (e.g. WR-01-002, D6) where D6 is a grid reference using the map specific grid.
- 3.2.3 The surface water features are based on the Environment Agency's Detailed River Network (DRN) with the addition of water bodies noted on the Ordnance Survey's (OS) 'OS VectorMapDistrict'.

¹ Water Framework Directive - *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*, Strasbourg, European Parliament and European Council

² Environment Agency (2009) *River Basin Management Plan, Thames River Basin District*

³ The Environment Agency's Detailed River Network (DRN) shows the route to cross a culverted watercourse (Map WR-01-002). The watercourse has been included in the DRN to ensure connectivity. It is considered that any such watercourse is a part of the sewer network and is not a surface water feature. It has therefore not been included in this assessment.

Appendix WR-002-002

Table 1: Surface water features within 500m of the route in the study area

Water feature	Location description (Volume 5, Water Resources and Flood Risk Map Book map reference)	Watercourse classification ⁴	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value ⁵	Q95 ⁶ (m³/s)	Catchment area at crossing (km²)	Notes
GUC (the Regent's Canal)	The GUC (the Regent's Canal) is located within Camden Town. The canal enters the study area near Gilbeys Yard. It will be within 225m of the route of the HS1-HS2 Link over a distance of about 1.1km.	Artificial	GUC, Uxbridge to Hanwell Locks, Slough Arm, Paddington Arm (GB70610078) Moderate And Regent's Canal, lower section (GB70610510) Moderate	Good Potential and Good Potential	High	Not applicable	Not applicable	West of the Hampstead Road Lock the GUC (the Regent's Canal) forms part of the 'GUC, Uxbridge to Hanwell Locks, Slough Arm, Paddington Arm' WFD water body. East of the lock the GUC (the Regent's Canal) forms part of the 'Regent's Canal, lower section' WFD water body.
York Way small pond	The pond is located near the depot at York Way, King's Cross Station. (CFA02-P01)	Not applicable	Not applicable	Not applicable	Low	Not applicable	Not applicable	Isolated pond located about 230m south of the route in an area of rough ground comprising storage yards and depots.

⁴ Water-feature classifications: Section 113 of the Water Resources Act 1991 defines a Main river as a watercourse that is shown as such on a Main river map. Section 72 of the Land Drainage Act 1991 defines an Ordinary watercourse as 'a watercourse that is not part of a Main river'. Section 221 of the Water Resources Act 1991 defines a watercourse as including 'all rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows'. Main rivers are larger rivers and streams designated by Defra on the Main river map and are regulated by the Environment Agency

⁵ For examples of receptor value, see Table 43 in the Scope and Methodology Report (SMR) Addendum, Volume 5: Appendix CT-001-000/2.

⁶ Derived from National River Flow Archive data and catchment areas calculated using the Flood Estimation Handbook - Centre for Ecology and Hydrology, (2009) Flood Estimation Handbook (FEH) CD-ROM Version 3.0. Q95 is the flow which is exceeded for 95% of the time (i.e. it is a low flow and the river will only have flows less than this for 5% of the time).

Water feature	Location description (Volume 5, Water Resources and Flood Risk Map Book map reference)	Watercourse classification ⁴	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value ⁵	Q95 ⁶ (m ³ /s)	Catchment area at crossing (km ²)	Notes
Small pond, Freight Lane	The pond is located close to the route of the HS1-HS2 Link at Freight Lane, Camden Town. (CFA02-P02)	Unclassified	Not applicable	Not applicable	Low	Not applicable	Not applicable	Located about 45m north of the route, close to railway lines within a highly urban area. Aerial photographs indicate this is a man-made balancing pond to receive drainage from roads of the cement batching plant on Freight Lane.

- 3.2.4 Table 2 summarises licensed surface water abstractions within 500m of the route in the study area⁷. There is the potential for unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m³ per day.

Table 2: Licensed surface water abstractions

Licence identifier (map reference number and Environment Agency reference)	Distance and direction from route (m)	Abstraction source	Maximum annual abstraction quantity (m ³)	Maximum daily abstraction quantity (m ³ /d)	Purpose
SW81 and SW94 (28/39/39/0164)	160m south and 500m south-east	GUC (the Regent's Canal)	70,100,000 (across whole licence)	19,520 (across whole licence)	Production of energy

- 3.2.5 No current surface water discharge consents have been identified within the study area.

3.3 Groundwater

- 3.3.1 A summary of the geological units present in the Camden Town and HS1 Link area, along with their hydrogeological characteristics, is presented in Volume 2, CFA report 2, Section 8.
- 3.3.2 Map WR-020-002 (Volume 5, Water Resources and Flood Risk Assessment Map Book) indicates the spatial distribution of the bedrock formations in the area. There are no superficial deposits in the study area. A schematic cross-section along the line of the route in this area showing geological strata and the location of the Proposed Scheme is presented in Figure 1.
- 3.3.3 The London Clay Formation underlies the whole of the study area. The London Clay Formation comprises unproductive strata (non-aquifer).
- 3.3.4 The geological succession beneath the London Clay Formation comprises of the:
- Harwich Formation, a thin sandy deposit (at least locally);
 - Lambeth Group (also termed the Upnor, Woolwich and Reading Formations) which comprises mixed sands, clays and pebbles deposits in some locations;
 - Thanet Sand Formation, a greenish and brownish grey, silty, fine-grained sand; and
 - White Chalk Subgroup, which is a succession of soft white limestones.
- 3.3.5 Figure 2 presents the groundwater elevation contours in the Chalk aquifer for this study area and adjacent areas using data from January 2012⁸. It should be noted that

⁷ Surface water abstractions for public supply are not included.

the Chalk is confined so the apparent water level is a representation of the water level that would be observed if the Chalk was penetrated by a borehole. It is not indicative of groundwater being present in the London Clay Formation. Groundwater flow in the study area is towards the south-east as shown by the groundwater elevation contours in Figure 2.

⁸ Environment Agency (2013), *Management of the London Basin Chalk Aquifer Status Report 2013*

Appendix WR-002-002

Figure 1: Schematic cross section of geology and route in the study area.

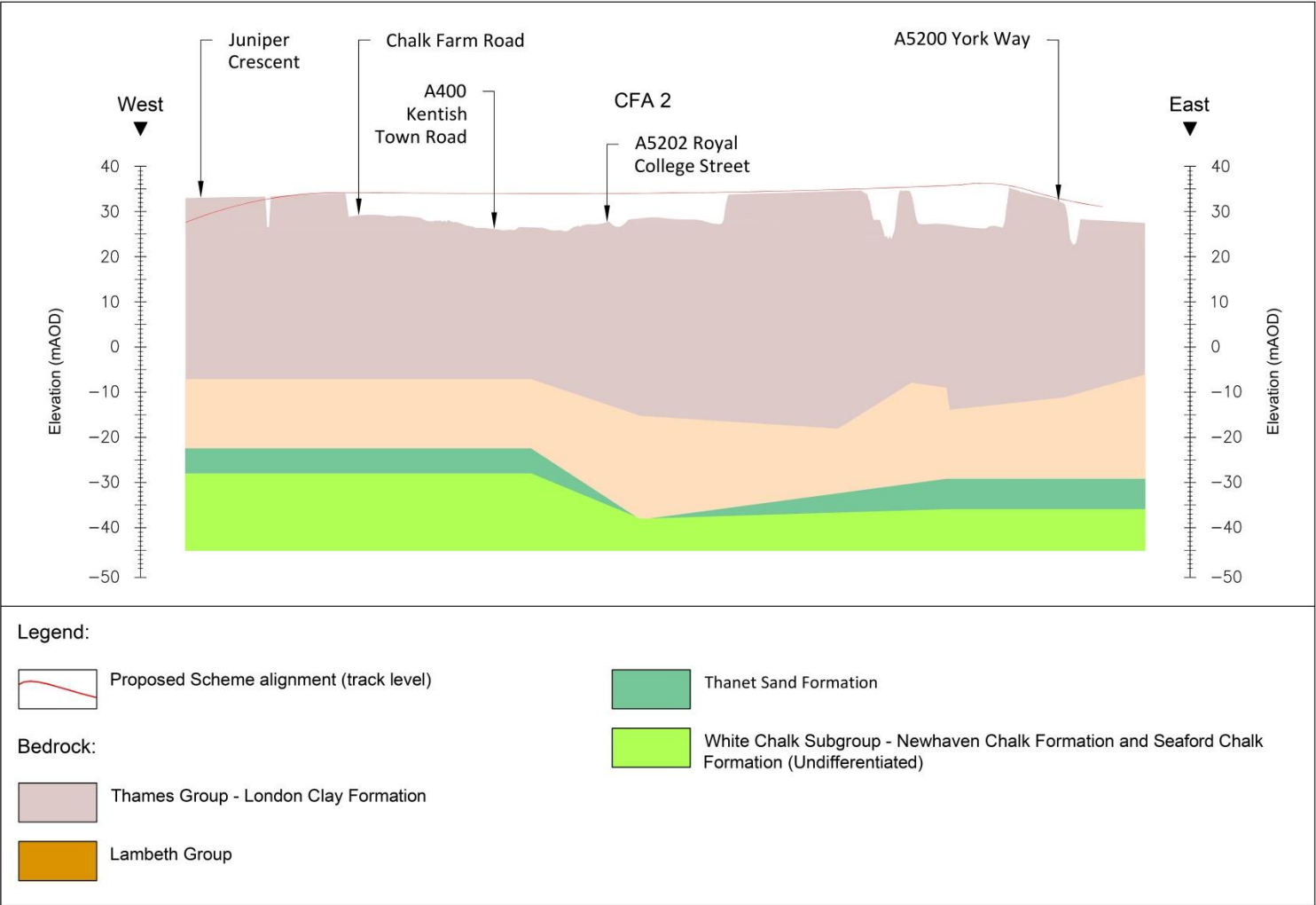
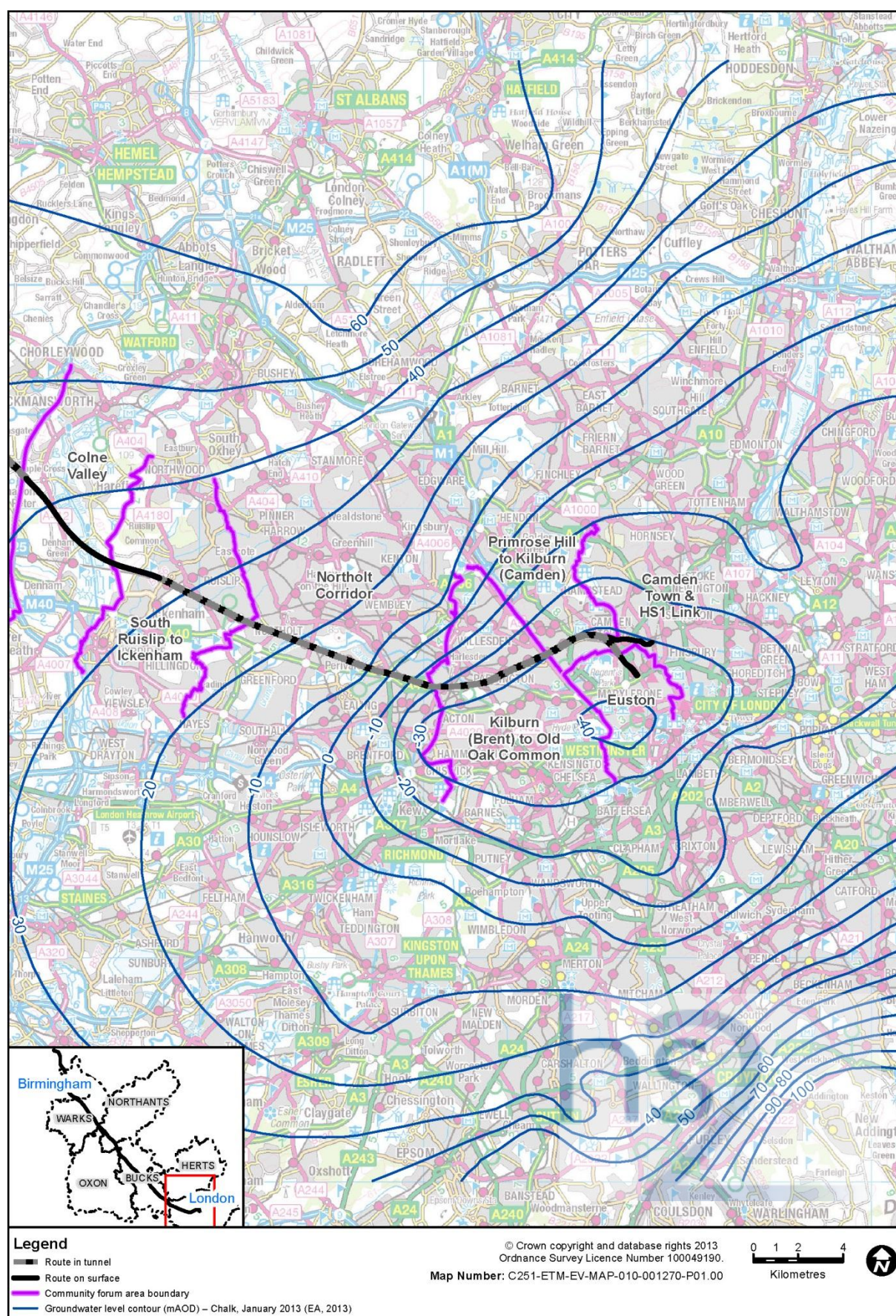


Figure 2: Groundwater elevation contours for this study area and the surrounding area



- 3.3.6 Table 3 summarises licensed groundwater abstractions or source protection zones (SPZ) located within 1km of the route. There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m³ per day.

Table 3: Licensed groundwater abstractions

Licence identifier (map reference number and Environment Agency reference)	Distance and direction from route (m)	Abstraction horizon	Maximum annual abstraction quantity (m ³)	Max daily abstraction quantity (m ³ /d)	Purpose	Number of boreholes
Public water supplies (PWS)						
SPZ located in Islington, approximately 400m south-east of the route. (Licence number confidential)	400m south-east	Chalk	914,544	3,024	Public water supply	1
Private abstractions						
GW90 (TH/039/0039/027)	65m north	Chalk	33,400	200	Industrial, commercial and public services – mineral products	1
GW83 and GW84 (28/39/39/0091)	500m north	Chalk	4,455	605	Process water	2
			13,542	-	Drinking, cooking, sanitary, washing, (small garden) – commercial/industrial/public services	

- 3.3.7 There are no consented discharges to ground/groundwater within 1km of the Proposed Scheme in the study area.

3.4 Surface water/groundwater interaction

- 3.4.1 No surface water/groundwater interactions have been identified within 500m of the route in the study area.

3.5 Water dependent habitats

- 3.5.1 There are no sites with ecological designations crossed by the Proposed Scheme in this area.

4 Site specific assessments

4.1 Surface water

- 4.1.1 Table 4 summarises all potential impacts and effects to surface water features from the Proposed Scheme in the Camden Town and HS1 Link area. Only those impacts and effects that are classed as significant are presented in Volume 2, CFA Report 2, Section 13.4.
- 4.1.2 Table 4 only includes water features which could potentially be impacted by the Proposed Scheme. Features such as isolated ponds and drains which will lie outside the construction footprint and area of impact of the Proposed Scheme are not included. Details of the features, however, are provided in Table 1.
- 4.1.3 The draft Code of Construction Practice (CoCP), referred to in Table 4, sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme (see Volume 5: Appendix CT-003-000/1). These will provide effective management and control of the impacts during the construction period.

Appendix WR-002-002

Table 4: Summary of potential impacts to surface water

Surface water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Freight Lane small pond	Low	Within construction footprint	Isolated water body 45m to the north of route with no links to other watercourses.	Negligible impact Neutral effect (Not significant)	None required	Negligible impact Neutral effect (Not significant)	None	None	Not applicable
The GUC (the Regent's Canal)	High	Construction work in close proximity to the GUC (the Regent's Canal)	No works directly adjacent to the Regent's Canal so limited potential for surface water flow and quality effects.	Negligible impact Neutral effect (Not significant)	Subject to appropriate mitigation as discussed in the draft CoCP, for polluting materials, management of earthworks and rate of surface runoff.	Negligible impact Neutral effect (Not significant)	None	None	Construction (temporary)

5 Site specific groundwater assessments

5.1 Summary of assessment

- 5.1.1 The Proposed Scheme will not penetrate below the base of the London Clay Formation, a non-aquifer. Consequently there will be no adverse effects on groundwater in the Camden Town and HS1 Link area.
- 5.1.2 Table 5 summarises the assessment for groundwater receptors.

Appendix WR-002-002

Table 5: Summary of potential impacts to groundwater receptors

Receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
Hydrogeology (groundwater)									
Chalk Principal aquifer	High	HS1 - HS2 Link portal HS1 - HS2 Link tunnel	The Proposed Scheme will not penetrate below the base of the London Clay Formation, a non-aquifer. Consequently there is no mechanism for the Proposed Scheme to impact groundwater flow or quality in the Chalk Principal aquifer.	Negligible impact Neutral effect (Not significant)	None required	Negligible impact Neutral effect (Not significant)	None	None	Not applicable
Abstractions									
SPZ located in Islington, approximately 400m south-east of the route. (Licence number confidential)	Very high	HS1 - HS2 Link portal HS1 - HS2 Link tunnel	The Proposed Scheme will not penetrate below the base of the London Clay Formation, a non-aquifer. Consequently there is no mechanism for the Proposed Scheme to impact on this abstraction which obtains its water from the underlying Chalk aquifer.	Negligible impact Neutral effect (Not significant)	None required	Negligible impact Neutral effect (Not significant)	None	None	Not applicable

Receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effect	Duration of effect
GW90 (TH/039/0039/027)	Moderate	HS1 - HS2 Link portal HS1 - HS2 Link tunnel	The Proposed Scheme will not penetrate below the base of the London Clay Formation, a non-aquifer. Consequently there is no mechanism for the Proposed Scheme to impact on this abstraction which obtains its water from the underlying Chalk aquifer.	Negligible impact Neutral effect (Not significant)	None required	Negligible impact Neutral effect (Not significant)	None	None	Not applicable
GW83 and GW84 (28/39/39/0091)	Moderate	HS1 - HS2 Link portal HS1 - HS2 Link tunnel	The Proposed Scheme will not penetrate below the base of the London Clay Formation, a non-aquifer. Consequently there is no mechanism for the Proposed Scheme to impact on this abstraction which obtains its water from the underlying Chalk aquifer.	Negligible impact Neutral effect (Not significant)	None required	Negligible impact Neutral effect (Not significant)	None	None	Not applicable

6 References

ARUP/URS (2012), *HS2 London to West Midlands Environmental Impact Assessment Scope and Methodology Report*.

Arup/URS (2013), *HS2 London to West Midlands Environmental Impact Assessment Scope and Methodology Report Addendum*.

Environment Agency (2013) *Management of the London Basin Chalk Aquifer Status Report 2013*.

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European Commission, *Water Framework Directive - Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*, Strasbourg, European Parliament and European Council

Land Drainage Act (1991), London, Her Majesty's Stationery Office.

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